# HOMER
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# HLT Online Monitoring Environment including ROOT

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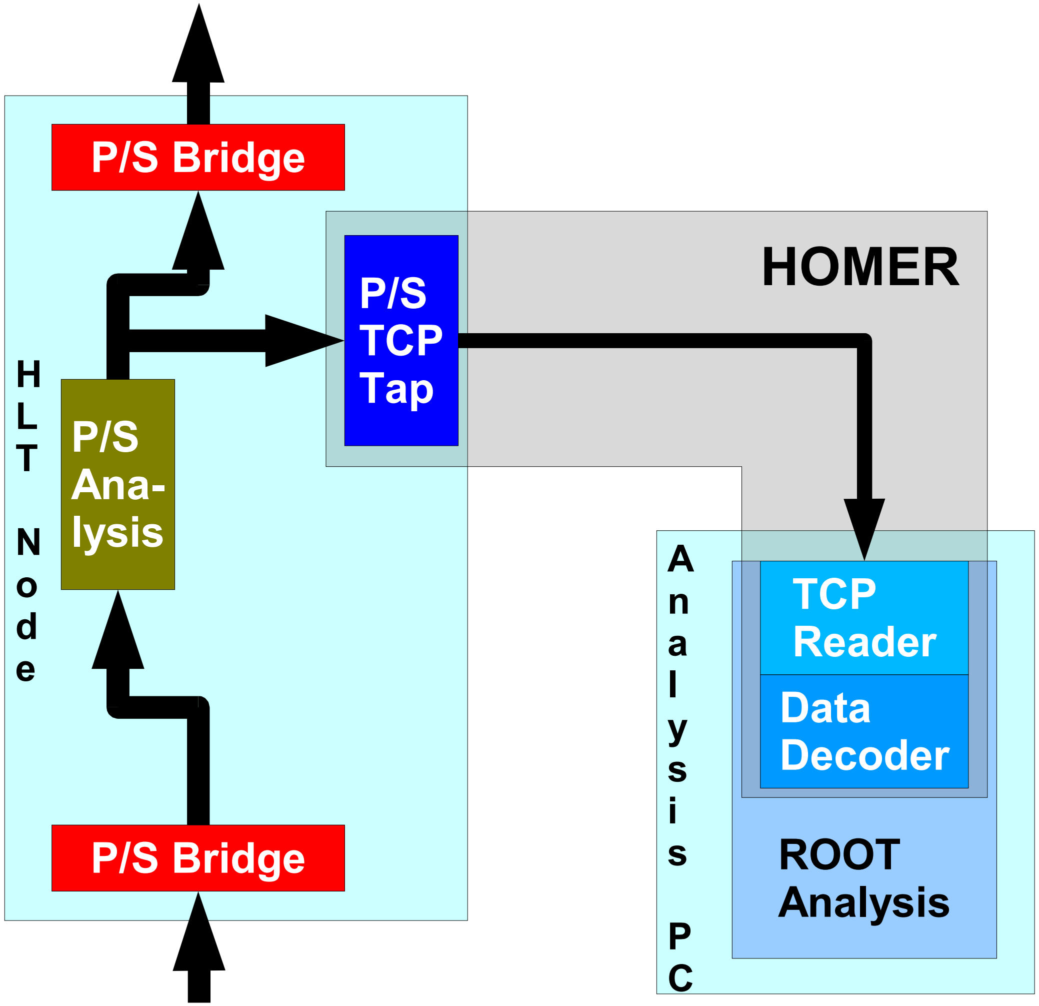
# HOMER Overview - Purpose

- **Access to Publisher/Subscriber data stream**
  - **Examine data at any stage of P/S processing**
- **Debugging aid**
  - **Coupled w. proper publisher components**
  - **Can provide quick access to detector data into analysis process**
    - E.g. ROOT, but not limited to it
  - **E.g. via**
    - HLT-RORC
    - TRD DCS (work in progress)
    - TPC RCU/DCS (work in progress)

# HOMER Overview - Architecture

- System has two principal parts
  - Tap into Publisher/Subscriber data stream
  - ROOT „bucket“ to be filled with data

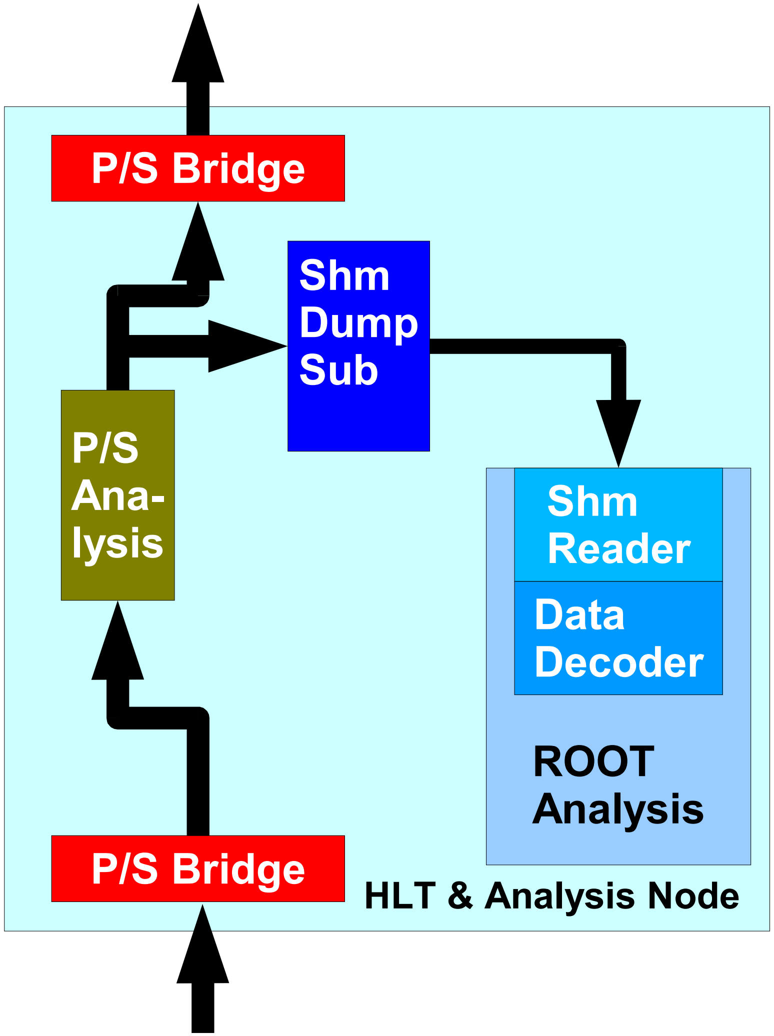


# Publisher/Subscriber Monitoring Components

- Two monitoring components
- Different access to provided data
  - System V shared memory
  - TCP
- Format of provided data is identical
- Both are standard P/S Data sink components
  - Attachable to any data source or any data processor
  - Access to data at any point of processing chain

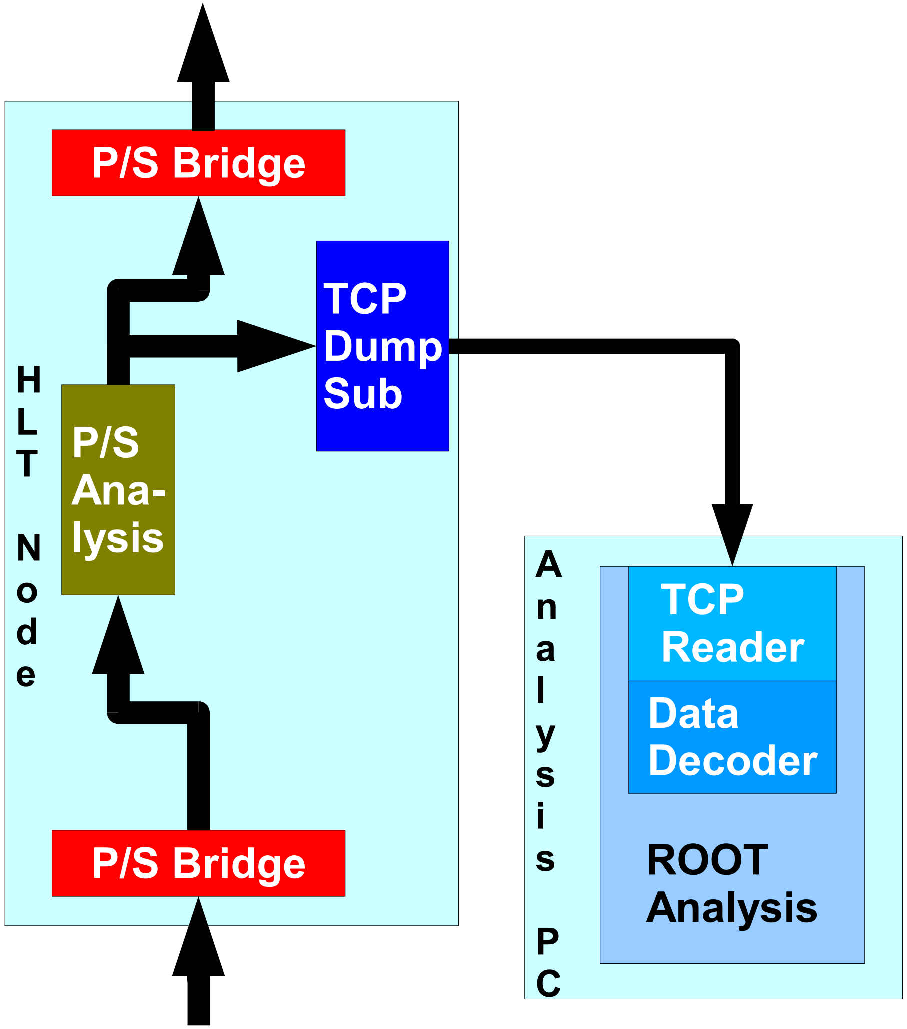
# Shared Memory Monitoring Component

- ShmDumpSubscriber
- Stores data into SysV shared memory buffer
- When ROOT (or other client) runs on same PC
- Simple flow-control via initial word in buffer
  - Initial word holds size of data in buffer
  - Zero means buffer empty
  - Non-zero means data is in buffer



# TCP Monitoring Component

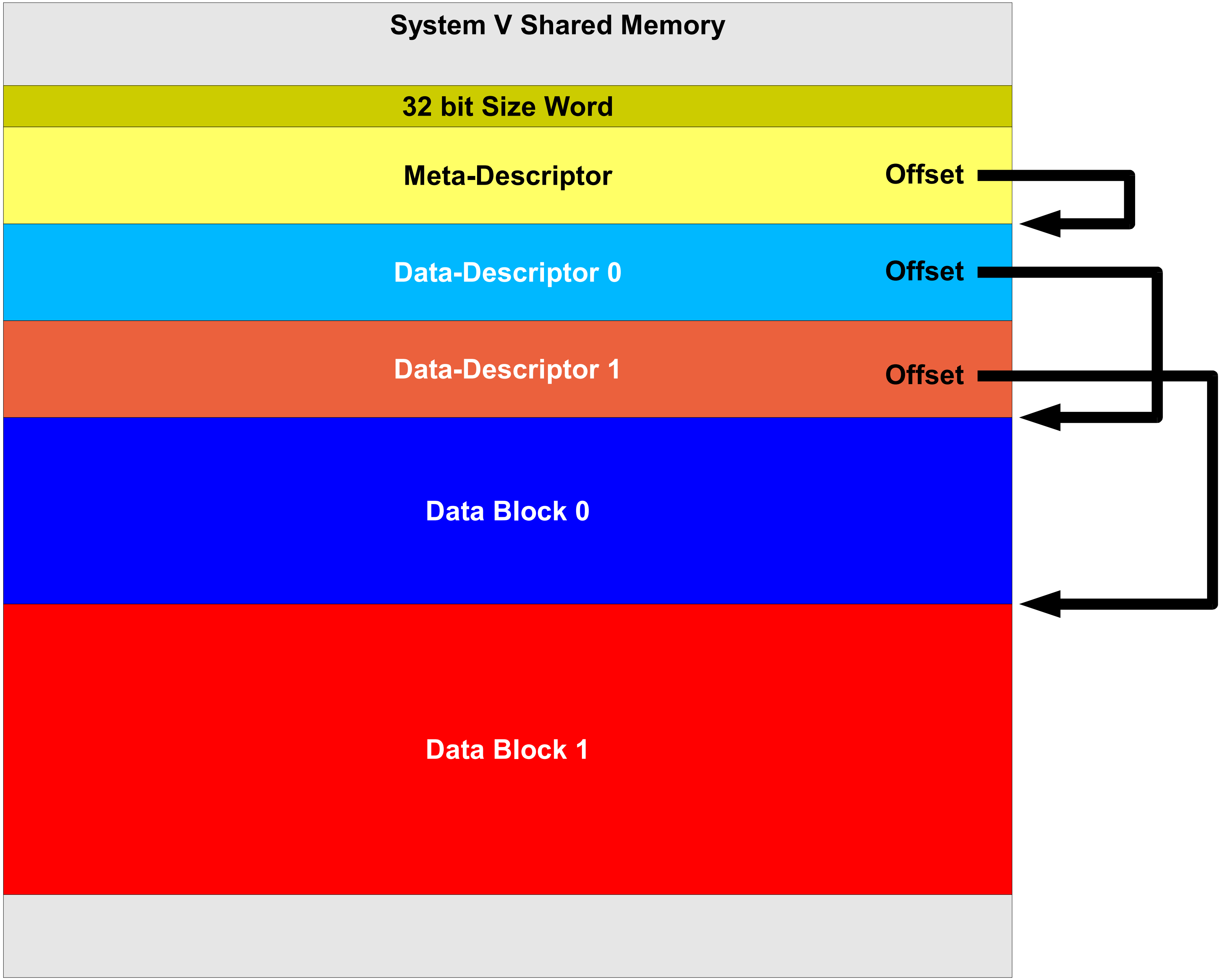
- TCPDumpSubscriber
- Accepts TCP connections on specified port
- Waits for event requests
- Sends next received event after request
- Connection kept open until closed by client
  - Or until protocol error
- Initial 32 bit word of received data holds size of remaining data



# Data Format

- **Data starts w. descriptor structures**
  - **One meta-descriptor f. whole event**
    - Holds information about event, e.g.
      - Event ID
      - Number of data blocks/descriptors
    - Offset element points to data-descriptors
  - **One data-descriptor per data block in event**
    - Holds information about block, e.g.
      - Data type & origin
      - Size
    - Offset element points to data block
- **Descriptors are followed by actual event data blocks**

# Data Format - Shared Memory

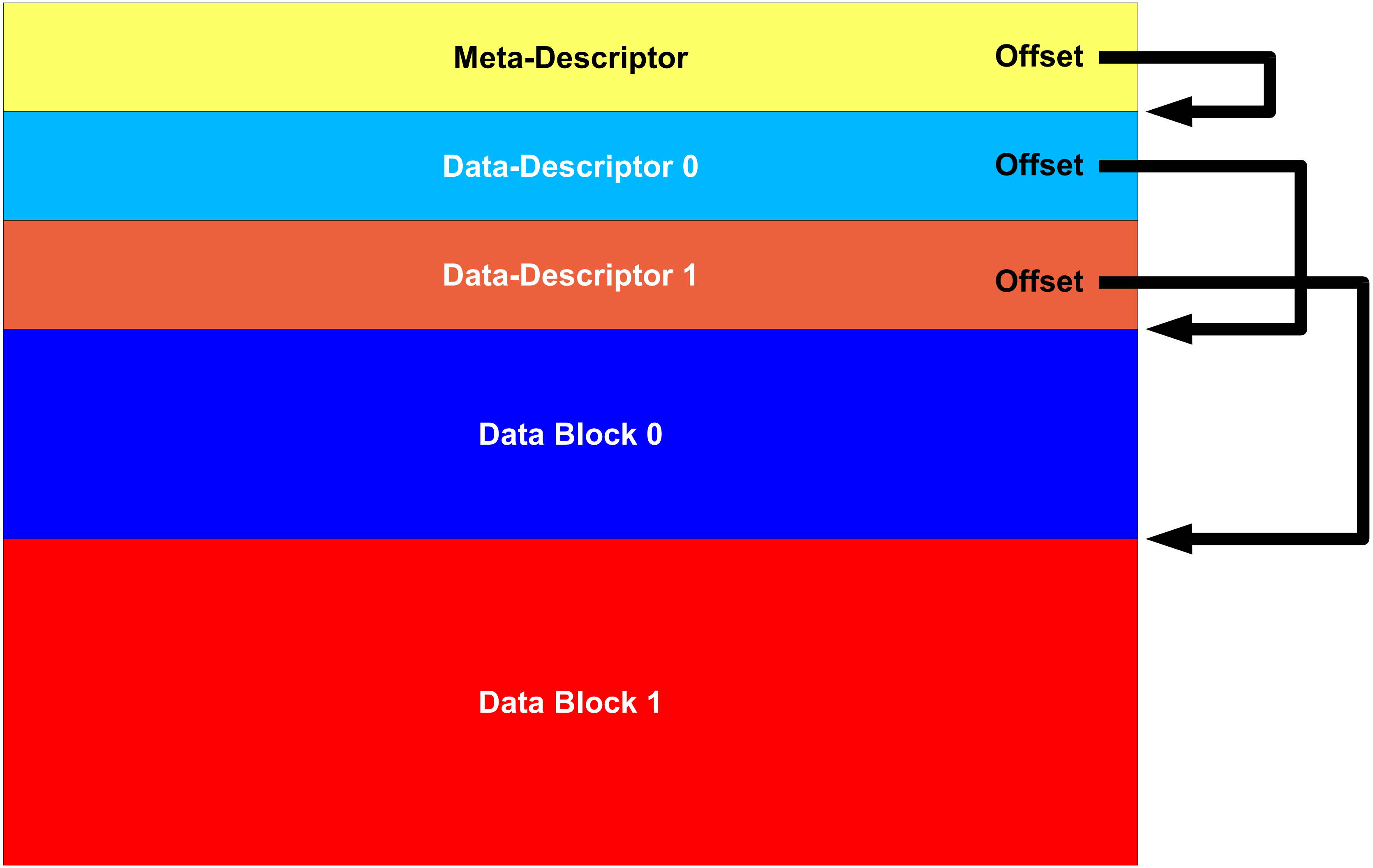


# Data Format - TCP

## Size Word Received over TCP

32 bit Size Word

## Data Block Received over TCP



Meta-Descriptor

Offset

Data-Descriptor 0

Offset

Data-Descriptor 1

Offset

Data Block 0

Data Block 1

# ROOT Interface

- Still work in progress
  - ROOT API not fully consolidated
  - But working already
- One version:
  - Macro for readout from TCPDumpSubscriber
    - ReadTCPDumpSubscriberData.C
  - Class („macroable“ via .L) to decode data
    - AliHLT_OMShmDecoder.(h|cpp)
      - `root> .L AliHLT_OMShmDecoder.cpp`
- Other possibility:
  - Integrate ~15 line TCP readout code into ROOT macro
  - Explicitly parse input data (~10-20 lines)

# Read TCP Data Macro

- Simple ROOT Macro (ReadTCPDumpSubscriber.C)
  - Loadable via .L
  - Executable via .x
- Requires hostname and port for TCPDumpSubscriber
- Returns pointer to data and data size
  - Memory is allocated inside, has to be freed by `delete []`
- Handles protocol w. TCPDumpSubscriber

# Data Decoder

- Initialized w. pointer to data and data size
- Allows to query event ID
- Allows to query number of data blocks
- For each data block allows to query
  - Pointer to data
  - Size of data
  - Type of data

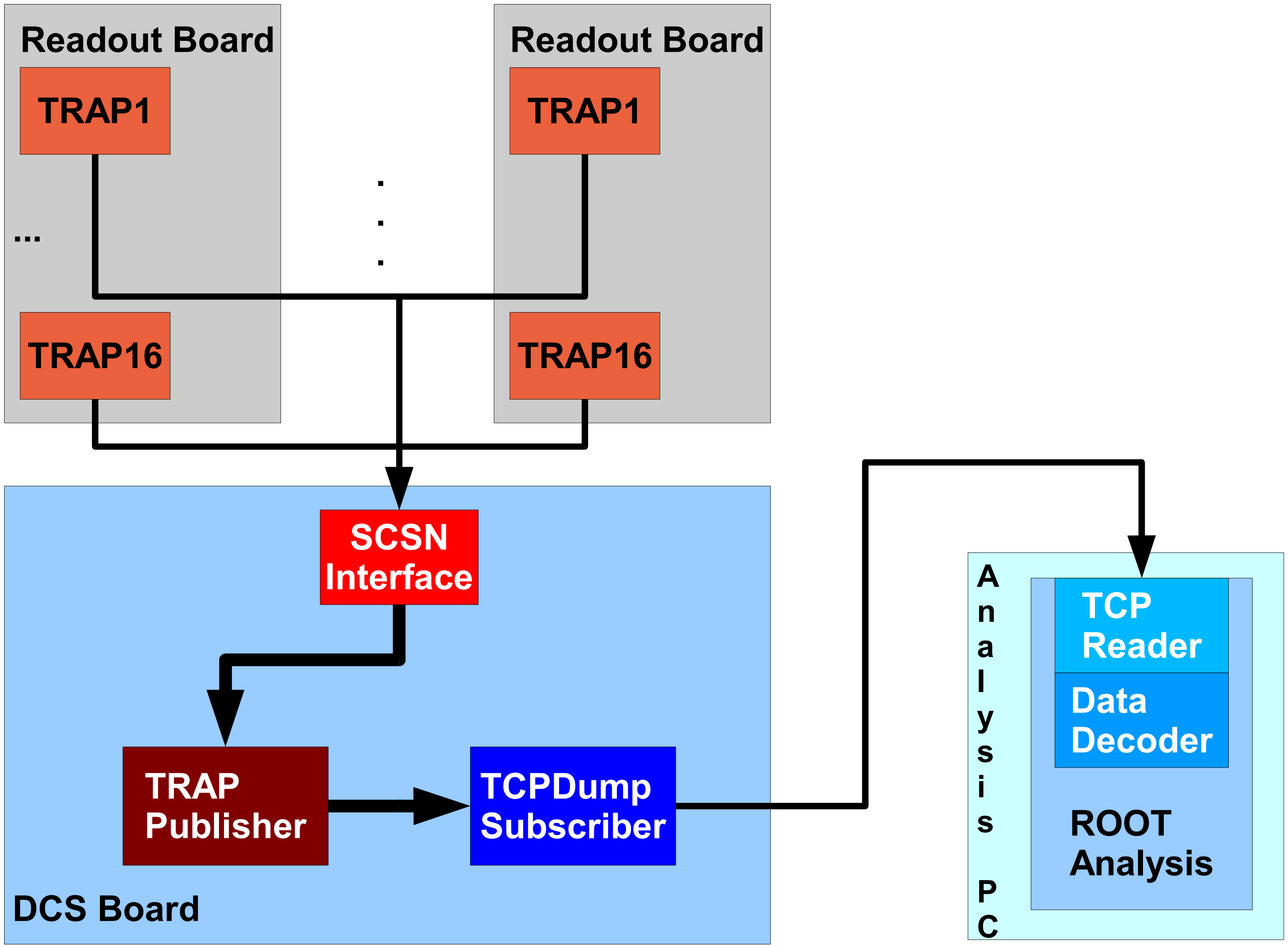
# Applications – TRD-DCS Readout

## Work in progress

- TRD Readout
  - TRAPPublisher component on DCS board
  - Readout of TRAP chips
  - TCPDumpSubscriber
  - ROOT

# Applications – TRD-DCS Readout

## Data Flow



# Applications

## Work in progress

- TPC Readout
  - RCUPublisher component on DCS board
  - Readout of Altros via RCU
  - TCPDumpSubscriber
  - ROOT

# Applications

## Working

- PCI Readout card
  - HLT-RORC Readout
  - ACEX Readout for TRD test setup
- Attached either
  - TCPDumpSubscriber
  - ShmDumpSubscriber
- Into ROOT
  - On same machine (Shm)
  - On different machine connected via network (TCP)
- Used for TPC ClusterFinder Event Display

# Conclusion

- **HLT Online Monitoring is progressing**

- **Already usable**

- **Several scenarios imaginable & already envisioned**

- **Should prove to be a powerful tool for debugging of analysis components, processing chains, and detectors**